Climate Alert

CLEANER ENERGY FOR THE SOUTHWEST

ENVIRONMENTAL DEFENSE
finding the ways that work

WESTERN RESOURCE ADVOCATES

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Our mission

Environmental Defense is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

Western Resource Advocates is a non-profit environmental law and policy organization dedicated to restoring and protecting the natural environment of the Interior West. Our work is focused on three strategic program areas: water, energy and lands.

The complete report is available online at www.environmentaldefense.org and at www.westernresourcesadvocates.org.

Contents

Executive summary

In the southwestern United States, the race is on between efforts to curb global warming pollution and proposals to build more than a dozen outdated, high-polluting power plants. The governors of Arizona and New Mexico have adopted specific targets and timetables for reducing their states' global warming pollution, calling for economy-wide reductions of 50 to 75% by mid-century, compared to recent levels. But these efforts could be sharply undercut if additional coal-fired power plants are built in the region using outdated technology. More than a dozen such plants have been proposed; the magnitude of the yearly greenhouse gas emissions expected from these plants would exceed the amount of emissions reductions targeted by either Arizona or New Mexico.

The threat of global warming is real and urgent. If global climate change is to be stopped and reversed, we need comprehensive action to reduce emissions of heat-trapping greenhouse gases. Choices about how we use and produce electricity are especially urgent, because conventional fossil fueled power plants are large and long-lived sources of global warming pollution.

The proposals for outdated coal plants in the Southwest must be rejected. Instead, new power demand should be met with energy efficiency and renewable resources such as solar, wind, biomass and geothermal. Where new coal-fired plants cannot be avoided, they must be designed and built to maximize thermal efficiency and capture and sequester carbon dioxide emissions. We owe it to our children and grandchildren to move to 21st-century power choices right now.

Global warming in the West

Rising ocean levels, melting glaciers and violent storms have become the signature threats of global warming. But hundreds of miles from the sea, the deserts and mountain ranges of the American Southwest are precariously vulnerable to climate change. Unless we take aggressive action, scientists expect global warming to have profound consequences across the Southwest in this century. Changes to the amount and timing of precipitation and snowmelt could dramatically alter the availability of al-

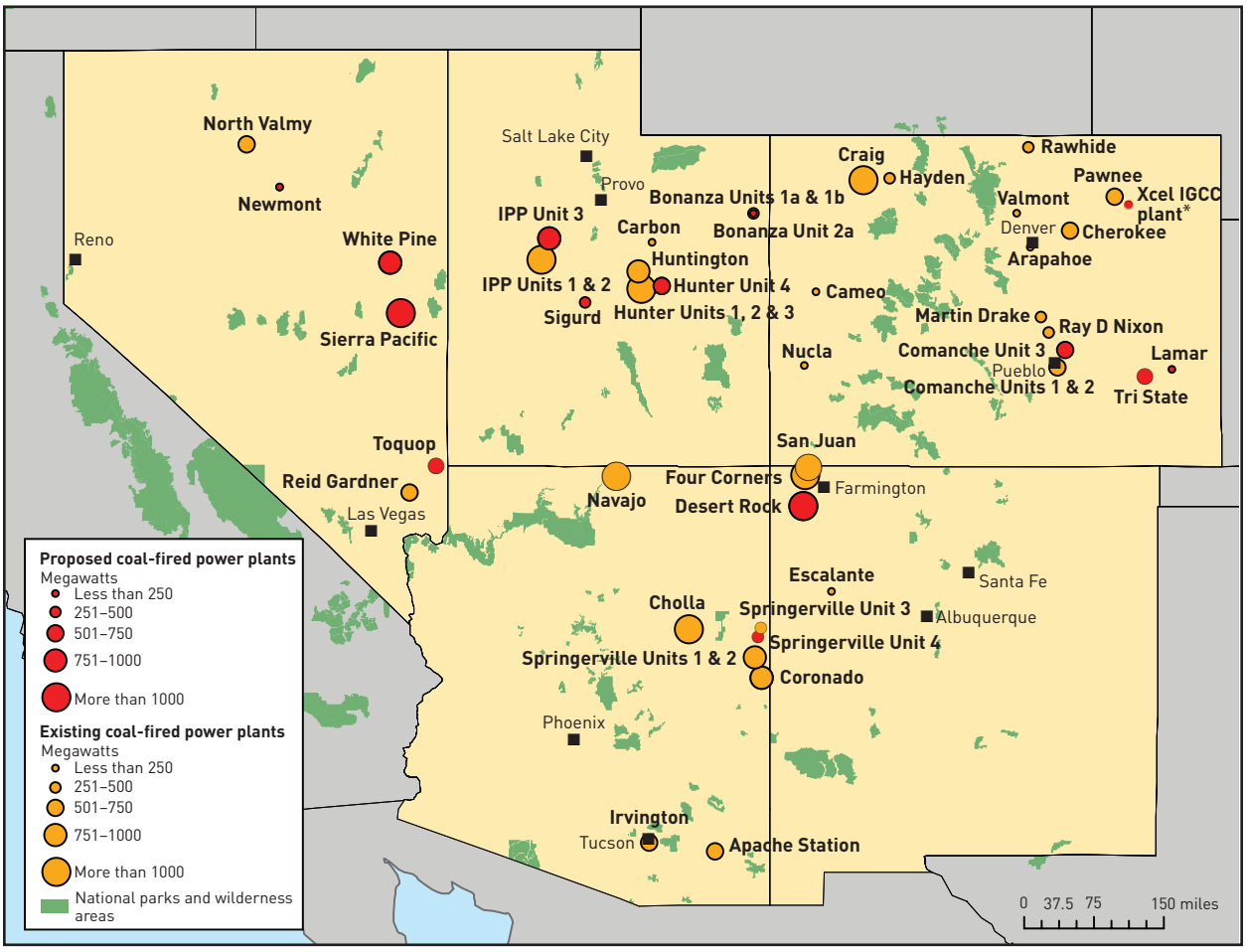
More damaging coal for the Four Corners: Sithe Global's proposed Desert Rock Power Plant

The proposed Desert Rock power plant on the Navajo Nation near Farmington, NM, illustrates the obsolete, business-as-usual approach that typifies most of the power plant proposals in the Southwest. In the summer of 2006, the U.S. Environmental Protection Agency (EPA) issued a proposed permit for the construction of this 1500 MW coal plant, which would discharge 10.5 million tons of carbon dioxide each year. At this level, the Desert Rock plant would erase one-third of the reductions forecast from the full implementation of California's landmark restrictions on global warming pollution from its millions of motor vehicles. Ironically, EPA claims its proposed permit will "limit air pollution emissions from the facility to levels that protect public health and the environment." But this misleading statement completely overlooks the profound effects of global warming pollution.

ready scarce water resources and increase seasonal flooding. Droughts could also become more frequent and extreme. The vibrant agricultural industry could suffer, drinking water could become harder to obtain, and fragile desert and mountain ecosystems could disappear. Either drier conditions or the increased vegetation resulting from wetter conditions could lead to more dangerous and costly wildfires. Towns that rely on weather-driven tourism could lose their economic engines, and rising summer temperatures could challenge the very livability of some desert areas.

Against the backdrop of these grim possibilities, policymakers in the Southwest must choose how to answer the region's booming demand for power generation. In Arizona, Colorado, New Mexico, Nevada and Utah, existing coal-fired power plants produced 160 million megawatt hours (MWh) of electricity in 2004, and 176 million tons of carbon dioxide. The scenic, historic and culturally rich Four Corners area already hosts some of the largest power plants in the West, and is the proposed site of yet more massive coal-fired plants proposed for construction over the coming years. As shown in Figure ES-1 and Table ES-1, at least 14 new coal-fired power plants, totaling more than 9,000 megawatts (MW) of new capacity,

FIGURE ES-1
Existing and proposed coal-fired power plants in the southwestern United States



*This is a possible location. The actual location has not yet been announced.

TABLE ES-1

Global warming pollution burden from new or proposed coal-fired power plants in Arizona, Colorado, New Mexico, Nevada and Utah

New or proposed plant	Location	Total capacity megawatts	CO2[a] tons per year
Springerville 3[e] & 4	North of Springerville, AZ	800	6,700,000
Comanche 3	Near Pueblo, CO	750	6,300,000
Lamar[c]	Lamar, CO	37.5	320,000
Tri-State[c]	Southeastern CO	700	5,900,000
Xcel IGCC[d]	Eastern CO	300–350	—
Desert Rock 1 & 2	Southwest of Farmington, NM	1,500	10,500,000
White Pine[c]	White Pine County, NV	500-800[b]	5,500,000
Newmont	Dunphy, NV	200	1,600,000
Ely Energy Center[c]	North of Ely, NV	1500	12,600,000
Toquop[c]	Northwest of Mesquite, NV	750	6,300,000
Sevier	Near Sigurd, UT	250	1,900,000
Intermountain Power (IPP) 3	Near Delta,UT	950	6,900,000
Hunter 4	Near Castle Dale, UT	600	4,200,000
Bonanza 2a	Near Bonanza, UT	110	1,100,000
	Total	**9,100**	**69,900,000**

[a] Unless otherwise noted, CO_2 emissions estimated assuming 85% capacity utilization and emissions rates of 205 lb CO_2 per million Btu for bituminous coal and 212.7 lb CO_2 per million Btu for subbituminous coal. http://www.eia.doe.gov/oiaf/1605/coefficients.html

[b] Proposed size range. For the emission calculations, a capacity of 650 MW was assumed.

[c] Because detailed information was not available, CO_2 emissions for these facilities were estimated based on the 2002–2003 generation-weighted average CO_2 emission rate of all existing coal-fired power plants in the West (i.e., 1.13 tons CO_2/MWh) and assuming 85% capacity utilization.

[d] IGCC = integrated gasification combined cycle. This facility would be designed to capture and sequester some carbon dioxide; net CO_2 emissions are uncertain.

[e] Began operation in summer 2006.

are now in various stages of planning, permitting or construction in the five-state southwestern region. These proposed power plants would collectively emit nearly 70 million tons per year of global warming pollution, more than a 40% increase over the region's current burden from the same sector.

Coal-fired power plants are a major source of the carbon dioxide emissions that are causing climate change. New plants, if built with conventional technology, will continue to pollute the atmosphere for decades. Several proposed coal-fired plants in the Southwest plan to use improved technologies that will remove more sulfur dioxide, nitrogen oxides and particulate pollution than plants constructed a quarter century ago, and their developers promote them as "clean coal" plants. But it defies common sense to apply the term "clean" to coal plants that will discharge staggering amounts of global warming pollution for decades to come. Of all the new plants now proposed in these five states, only one has plans to control carbon dioxide emissions.

Cleaner choices for the future

Fortunately, coal is not the only local resource that can be used to meet the Southwest's growing power demand. The region is rich in renewable resources including solar, wind, biomass and geothermal energy sources. Energy efficiency is perhaps the most overlooked energy resource. The Southwest Energy Efficiency Project has concluded that available and proven energy-efficiency measures that could be implemented in the next 15 years could entirely eliminate the need for twenty-six 500-MW power plants in six western states (Arizona, Colorado, New Mexico,

Nevada, Utah and Wyoming). Western Resource Advocates has laid out a diversified energy portfolio for Arizona, Colorado, Montana, Nevada, New Mexico, Utah and Wyoming that could significantly reduce power-sector carbon dioxide emissions by the year 2020 while lowering electricity production costs. The diversified portfolio includes 20% in renewable sources and large investments in energy efficiency, thereby avoiding the need for new coal-fired power plants. The Southwest's ongoing energy building boom presents a momentous opportunity to set a new course toward more climate-friendly power generation and to avoid some of the damaging climate changes that threaten the entire region and the world.

The federal government has not yet answered the call to control global warming pollution, but states like Arizona, California and New Mexico (Table ES-2) are beginning to fill the void. California is a massive source of carbon dioxide, and like the rest of the West, has much to lose from the economic and environmental disruptions caused by rising temperatures. Beginning with its revolutionary commitment in 2002 to control carbon dioxide emissions from cars, California has charted a course to reduce global warming pollution that other western states can follow.

Most recently, Governor Schwarzenegger and the California legislature collaborated on two major bills to reduce global warming pollution in California. Assembly Bill 32 will reduce carbon dioxide emissions to 1990 levels by 2020. Senate Bill 1368 will require California utilities that buy power from out-of-state producers to ensure those producers meet minimum performance standards for the control of carbon dioxide emissions.

Southwestern states and tribes can build on California's visionary programs and reduce global warming pollution by taking the following steps:

1. Adopt binding caps to stabilize and reduce emissions of global warming pollution.

2. Tap energy-efficiency resources as the foremost tool for addressing growing electricity demand.

3. Adopt or strengthen renewable portfolio standards to harness the region's vast renewable energy potential.

4. Adopt well-designed, comprehensive resource planning and procurement rules for electric utilities that weigh the full costs, benefits and risks of new electrical generating resources that will

TABLE ES-2
Western state global warming pollution reduction timetables adopted by executive order

State	Pollution reduction target	Year to be achieved
Arizona (E.O. 2006-13, September 7, 2006)	Return to 2000 levels Reduce to 50% below 2000 levels	2020 2040
California (E.O. S-3-05, June 1, 2005)	Return to 2000 levels Return to 1990 levels Reduce to 80% below 1990 levels	2010 2020 2050
New Mexico (E.O. 05-033, June 9, 2005)	Return to 2000 levels Reduce to 10% below 2000 levels Reduce to 75% below 2000 levels	2012 2020 2050

add harmful global warming pollution to the atmosphere.

5. Adopt policies to promote increased use of distributed and highly efficient combined heat and power resources.

6. Require all new coal plants, effective immediately, to meet rigorous performance standards for greenhouse gas emissions that maximize thermal efficiencies and leverage new technologies to capture and sequester carbon dioxide pollution.

7. Focus transmission capacity expansion on projects that provide access to renewable resources.

CHAPTER 1

Global warming in the West: projected impacts are profound

The Southwest is a region with precariously balanced water resources, sensitive ecosystems and an economy that depends on climate-sensitive agriculture and weather-driven tourism. Regional-scale predictions of changes in precipitation because of global warming pollution are uncertain; current climate models do not agree whether precipitation in the Southwest will increase or decrease as temperatures warm. But whether global warming yields wetter or drier conditions, the region will face profound challenges.

Extremely hot summer temperatures are pushing the boundary of livability in many parts of the desert Southwest. The huge electrical demands from air-conditioning use in cities like Phoenix and Las Vegas will only go higher with increasing temperatures, further straining electrical supplies challenged by a growing population.

The water resources of the American West are already insufficient to keep up with a growing population and the demands of agriculture. "The amount and the quality of water supplies in today's highly engineered storage and delivery systems depend on precipitation falling at the right time, in the right place, for a sufficient amount of time, and in sufficient volume."[1] If higher temperatures cause increased precipitation, they will also likely lead to more precipitation falling as rain rather than snow, and to earlier snowmelt. These developments could severely limit the region's ability to store and use the precipitation that falls.[2] If a change in the snow/rain ratio is combined with earlier melting and reduced precipitation, the effect on water supplies could be considerably worse.

The interagency U.S. Global Change Research Program examined southwestern climate change scenarios for the Regional Climate Change Assessment and predicted increased precipitation occurring mostly in the fall and winter, rather than during the growing season. More precipitation could boost crop yields and forage for livestock;[3] however, if warming reduces the amount of precipitation stored in snow pack, flood risks would increase[4] and reservoir storage capacity might not be sufficient for summer use.[5] Other climate models predict higher temperatures without additional precipitation in many parts of the West. This scenario would contribute to the decline of both agriculture and ranching, because of increased aridity and reduced water availability.

Climate change could also threaten water levels in the Colorado River, which is the major source of fresh water for much of the Southwest. The river's flow is fully allocated among the seven states that make up its upper and lower basins, and Mexico. In some years the river's flow is less than the amount allocated among these competing interests. Changes predicted over the next century "would lead to a situation where total system demand (water deliveries plus reservoir evaporation) would exceed reservoir inflows."[6]

The risk of wildland fire in the West is expected to grow over the next century. A recent study conducted using the Parallel Climate Model, which was developed by the Department of Energy and the National Center for Atmospheric Research, predicted a significant upsurge in the number of days with high fire danger in the northern Rockies, Great Basin and Southwest, because of warming and corresponding reductions in relative humidity.[7] The increase in the frequency and intensity

of western wildfires since the mid-1980s has been strongly associated with rising spring and summer temperatures and earlier spring snowmelt.[8]

Communities that rely on outdoor recreation and tourism could be hard hit by higher temperatures. Resort areas and national park gateway communities across the West depend on the millions of visitors who come to hike, ski, fish, hunt, raft and view western wildlife and scenery. Increased temperatures could benefit some of these local economies, but climate change would devastate others, especially those that count on income from skiing.[9]

The ongoing, severe multi-year drought in the Southwest shows how precipitation levels can affect tourism. University of Arizona researchers determined that the number of hikers, boaters, anglers and others visiting Lake Powell since 1999 dropped along with the receding water levels of the lake. They estimated that in 2003, the falling lake level cost the Glen Canyon National Recreation Area 212,000 visitors, $14 million in local sales and 300 jobs.[10] Multiplication of these effects across the 26 million visitors to the Southwest's national parks each year suggests the significant economic impact the region could feel if rising temperatures lead to more frequent or prolonged droughts.

Higher temperatures could bring new and increased health threats to the West by raising the number of heat-stress deaths and outbreaks of infectious diseases such as plague, hanta virus, mosquito-borne diseases, and fungal diseases like valley fever.[11] During today's hot summers, the air quality is already worsening, as health-damaging ground-level ozone concentrations climb. Elevated ozone concentrations are associated with greater numbers of hospital admissions and emergency room visits in children and adults with preexisting respiratory conditions such as asthma. As temperatures rise, more ground-level ozone could be formed and health effects could worsen.

Natural systems in the West could be changed irrevocably because of global warming. Diversity could be diminished by increased invasion of exotic weed species that thrive on elevated carbon dioxide levels. Stream organisms, riparian areas, and lake and stream communities could be altered, with warmer water temperatures favoring non-native species over trout and other native western fish. [12]

The American West is characterized by dramatic changes in elevation, resulting in distinct ecosystem zones, such as grasslands or deserts at the base, forests at the intermediate elevations and alpine tundra at the top. These zones would shift as temperatures rise and precipitation changes. If the climate gets warmer and drier, all ecosystem zones are expected to shift upward. With warmer temperatures and more precipitation, forest zones are expected to expand in both directions. It is possible that the West's spectacular and fragile alpine tundra could simply disappear.[13]

CHAPTER 2

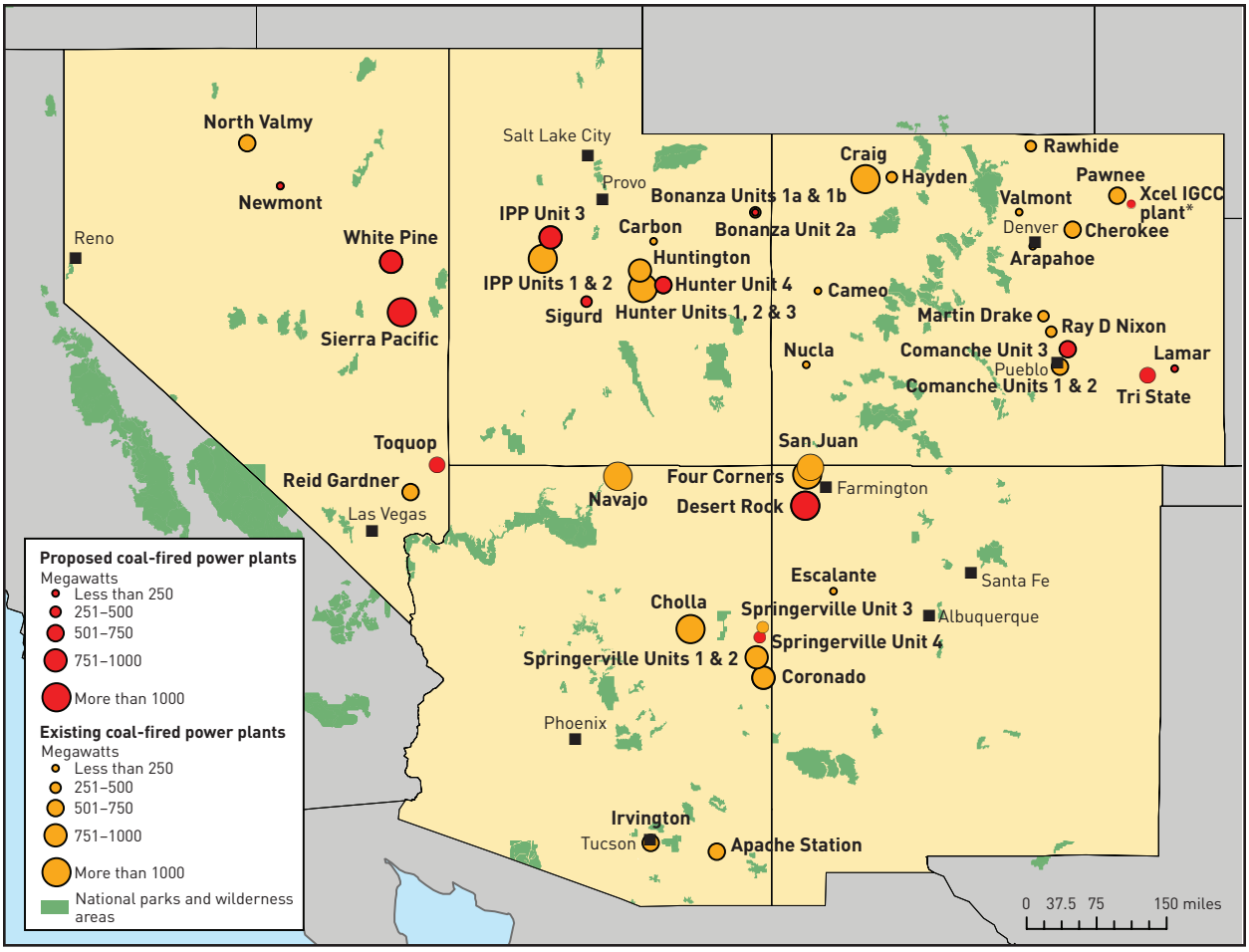
The global warming burden from Southwestern power plants

The two largest sources of carbon dioxide emissions in the United States are mobile sources such as cars and trucks, and power plants. Led by California, eleven states have already begun to require carmakers to reduce global warming pollution from motor vehicles. But the expected growth of emissions from new coal-fired power plants in the Southwest will severely undercut these reductions. States and tribes should reduce power plant carbon dioxide emissions for all the same reasons they are requiring car manufacturers to reduce greenhouse gas emissions. Carbon dioxide controls on power plants will protect our environment and economy, and will extend the progress made by efforts to reduce car emissions.

As shown in Figure 1, the Southwest already hosts some of the largest existing power plants in the West, and is the proposed site of yet more massive coal-fired plants to be built over the coming years. In Arizona, Colorado, New Mexico, Nevada and Utah,

FIGURE 1

Existing and proposed coal-fired power plants in the southwestern United States



*This is a possible location. The actual location has not yet been announced.

existing coal-fired power plants produced 160 million megawatt hours (MWh) of electricity in 2004, emitting 176 million tons of carbon dioxide pollution in the process.

The Department of Energy projects that annual carbon dioxide emissions from all power plants in the United States will grow by 1.1 billion tons, or 44%, between 2004 and 2030, unless action is taken quickly to stem this increase. This projected rise is equivalent to the annual carbon dioxide emissions from 196 million cars or 141 million light trucks. At least fourteen new coal-fired power plants, totaling more than 9,000 MW of new capacity, are already in various stages of planning, permitting or construction in the southwestern region. The many new coal-fired power plants currently on the drawing boards guarantee that the Southwest will contribute fully to this growing burden of global warming pollution unless these states insist on an urgent change of course.

Choices from the past: Navajo Generating Station

Power plants last a long time. While permit applications typically state that the expected life of a power plant is 40 years, in reality these plants become a permanent part of the landscape. We will be living for many decades with the decisions made today about the technology built into new power plants in the Southwest.

The Navajo Generating Station on the Navajo Nation in northern Arizona illustrates how the initial design of a power plant casts a shadow across the following decades. The plant's three electrical generating units commenced operation in 1974, 1975 and 1976. The 2,410-MW plant,[14] run by the Salt River Project Agricultural Improvement and Power District, uses conventional pulverized coal technology to produce power for customers in Arizona, Nevada and California. Twenty-one percent of its production is owned by and dedicated to the Los Angeles Department of Water and Power.

The environmental footprint of the Navajo Generating Station is immense. It uses up to 25,000 tons of coal per day if all units are running at full load.[15] This coal comes from the Black Mesa-Kayenta mining complex, one of the most extensive strip-mining operations in the United States. Each year the Navajo Generating Station uses almost 8 billion gallons of water from Lake Powell for cooling.[16] In 1991, the U.S. Environmental Protection Agency (EPA) required a 90% reduction in the emissions of sulfur dioxide from the Navajo Generating Station. But these measures and other beneficial controls that reduce air pollutants such as particulate matter, fail to address the plant's staggering carbon dioxide emissions.

In 2004, the Navajo Generating Station discharged more than 19 million tons of heat-trapping carbon dioxide to the atmosphere. That year, it was the sixth-largest power plant emitter of carbon dioxide in the country. Since 1995, this single plant has produced almost 200 million tons of carbon dioxide. That stunning amount of pollution was released during just one-third of the years the plant has operated, and represents a small fraction of the total carbon dioxide load it will release over its lifespan. As it has for the last 32 years, the Navajo Generating Station will continue to reflect its early 1970s engineering by emitting extensive volumes of greenhouse gases into the global atmosphere.

Present choices: Sithe Global's proposed Desert Rock Power Plant repeats the mistakes of the past

The legacy of massive carbon dioxide emissions over the last century challenges our efforts to stop climate change. Past pollution will contribute to global warming for decades to come. Design decisions being made today will shape the power supply fleet to be used for the next half-century. This makes it essential that we immediately require every new power plant to sharply reduce global warming pollution.

In the face of this urgency, the Desert Rock Power Plant proposed for construction on the Navajo Nation near Farmington, New Mexico, illustrates the business-as-usual approach that typifies most of the current power plant proposals in the Southwest. In the summer of 2006, EPA issued a proposed air permit for Sithe Global Power Company to construct and operate the 1,500-MW Desert Rock plant. Unlike existing western coal plants such as the Navajo Generating Station that use conventional pulverized coal technology, Desert Rock plans to use a supercritical boiler process that yields a higher thermal efficiency. But its owners have declined to include advanced technology to reduce global warming pollution. As proposed, the plant will discharge an estimated 10.5 million tons of carbon dioxide each year. At this level, the plant will erase one-third of the global warming reductions forecast from the full implementation of California's landmark restrictions on its millions of motor vehicles. These new greenhouse gas emissions will burden an area that is already the source of staggering amounts of global warming pollution from existing coal-fired power plants including the Four Corners Plant on the Navajo Nation in Fruitland, New Mexico, the San Juan Generating Station near Farmington, New Mexico, and the Navajo Generating Station in Page, Arizona.

EPA officials have described the proposed Desert Rock plant in glowing terms. "The emission limits required by the EPA's proposed permit for the Desert Rock power plant, planned by Sithe Global, Inc. and the Navajo Nation, are some of the most stringent in the country and would set a new level of performance for coal-fired plants in the United States."[17] "The EPA's proposed permit will require the best pollution controls available for a pulverized coal-burning power plant, and will limit air pollution emissions from the facility to levels that protect public health and the environment."[18]

These carefully crafted statements are true only in the sense that no existing pulverized coal-burning power plant in the United States is required to have any controls on carbon dioxide, and that EPA refuses to recognize carbon dioxide as an air "pollutant" within the meaning of the Clean Air Act.[19] In other words, the Desert Rock plant can be considered "clean" only if you completely ignore its greenhouse gas emissions and exclude global warming from EPA's core mission of protecting public health and the environment.

If this plant is built as now proposed, it would immediately leap into the upper tier of power plant carbon dioxide sources in the country. It will lock in 20th-century technology far into the 21st century and perpetuate, rather than reverse, the mistakes of the past. Allowing Desert Rock to be built as proposed, without measures to capture and control carbon dioxide emissions, will undo much of the hard-fought efforts to reduce global warming pollution from sources such as

automobiles, and worsen rather than reduce the Southwest's contribution to global warming.

More of the same: a look at the new coal-fired power plants proposed in the Southwest

Desert Rock is only one of the many new coal-fired power plants being developed in the Southwest. Table 1 lists fourteen of these proposed plants and their projected carbon dioxide emissions, which would total nearly 70 million tons each year. As shown in the table, these new plants would also emit large quantities of conventional air pollutants—sulfur dioxide, nitrogen oxides and particulate matter—that contribute to soot and smog and pollute scenic vistas in our national parks. The most dramatic numbers are for carbon dioxide. For comparison, if these plants are built, their new greenhouse gas emissions will match Utah's total greenhouse gas emissions for 2001.[20] These emissions would cancel out a large fraction of any reductions that would

TABLE 1
Air pollution burden from new or proposed coal-fired power plants in Arizona, Colorado, New Mexico, Nevada and Utah

New or proposed plant	Location	Total capacity megawatts	PM[c] tpy[a]	SO_2[c] tpy	CO_2[b] tpy	NO_x[c] tpy
Springerville 3[g] & 4	North of Springerville, AZ	800	470	No net increase	6,700,000	No net increase
Comanche 3	Near Pueblo, CO	750	360	No net increase	6,300,000	No net increase
Lamar[e]	Lamar, CO	37.5	21	140	320,000	110
Tri-State	Southeastern CO	700	390	2,700	5,900,000	2,100
Xcel IGCC[f]	Eastern CO	300–350	70	530	—	560
Desert Rock 1 & 2	Southwest of Farmington, NM	1,500	500	3,000	10,500,000	3,000
White Pine[e]	White Pine County, NV	500–800[d]	360	2,500	5,500,000	2,000
Newmont	Dunphy, NV	200	90	680	1,600,000	500
Ely Energy Center[e]	North of Ely, NV	1500	840	5,700	12,600,000	4,500
Toquop[e]	Northwest of Mesquite, NV	750	420	2,800	6,300,000	2,300
Sevier	Near Sigurd, UT	250	150	210	1,900,000	940
Intermountain Power (IPP) 3	Near Delta,UT	950	440	3,000	6,900,000	2,400
Hunter 4	Near Castle Dale, UT	600	420	No net increase	4,200,000	No net increase
Bonanza 2a	Near Bonanza, UT	110	160	300	1,100,000	430
Total		9,100	4,900	21,500	69,900,000	18,700

[a] tpy = tons per year

[b] Unless otherwise noted, CO_2 emissions estimated assuming 85% capacity utilization and emissions rates of 205 lb CO_2 per million Btu for bituminous coal and 212.7 lb CO_2 per million Btu for subbituminous coal. http://www.eia.doe.gov/oiaf/1605/coefficients.html.

[c] Emissions estimates for PM, SO_2 and NO_x based on limits in permit applications unless otherwise noted. Estimates may consequently overstate actual emissions.

[d] Proposed size range. For the emission calculations, a capacity of, 650 MW was assumed along with the emission factors listed in note e.

[e] Because detailed information was not available, PM, SO_2, and NO_x emissions for these proposed facilities were based on the average emission rate limits for all proposed new coal-fired power plants in the West (for which proposed or final emission limits are available) (i.e., 0.15 lb PM/MWh, 1.02 lb SO_2/MWh, and 0.81 lb NO_x/MWh) and assuming 85% capacity utilization. CO_2 emissions were based on the 2002–2003 generation-weighted average CO_2 emission rate of all existing coal-fired power plants in the West (i.e., 1.13 tons CO_2/MWh), and assuming 85% capacity utilization.

[f] IGCC = integrated gasification combined cycle. Emissions estimates based on 300 MW capacity, emissions rates for NO_x, SO_2 and PM from Eastman Gasification Services Company emissions comparison (Dec. 2003). This facility would be designed to capture and sequester some carbon dioxide; net CO_2 emissions are uncertain.

[g] Began operation in summer 2006.

be required under California's new global warming laws, or the Southwest Climate Change Initiative that was recently announced by the governors of Arizona and New Mexico. Like Desert Rock, all but one of these proposed plants represent design choices based in the last century rather than this century's awareness of the urgent need to reduce and contain carbon dioxide.

Springerville Generating Station, Arizona. Tucson Electric Power, a subsidiary of Unisource Energy Corporation, is adding two new conventional pulverized coal units to its existing plant north of Springerville. Together, these units will add 800 MW of capacity to this location. Tri-State Generation and Transmission Association will lease Springerville Unit 3, which went online this summer, and will control its entire output of 400 MW. Tucson Electric Power will run Unit 3 and purchase 100 MW of system capacity from Tri-State for up to five years, beginning in September 2006. Phoenix-based Salt River Project will purchase another 100 MW of output from Tri-State over a 30-year period. Salt River Project also will develop and own Unit 4, a 400-MW unit that is planned to begin operation in late 2009. Tucson Electric Power will operate Unit 4. The two Springerville units will use a total of 8.6 billion gallons of groundwater per year. **Projected carbon dioxide emissions from units 3 and 4: 6,700,000 tons per year.**

Comanche, Unit 3, Colorado. Public Service Company of Colorado, a subsidiary of Xcel Energy, is building a new 750-MW coal-fired power plant near Pueblo. The plant is expected to go into service in 2009. Comanche Unit 3 is expected to use 730 million gallons of water per year, obtained from the Pueblo Water Board. As part of a settlement agreement on Comanche Unit 3, Xcel Energy committed to expanded energy conservation and use of renewable energy resources, and to account for the financial risks of global warming pollution in its acquisition of new electric generating resources. **Projected carbon dioxide emissions from Comanche Unit 3: 6,300,000 tons per year.**

Ely Energy Center, Nevada. Sierra Pacific Resources proposes to build a 1,500-MW conventional pulverized coal power plant near Ely in White Pine County, Nevada. Sierra Pacific states that its Ely Energy Center would provide energy to its subsidiary, Nevada Power Company. Sierra Pacific estimates the Ely Energy Center would use 2.6 billion gallons of water per year. If built as proposed, the Ely plant would be the largest source of greenhouse gas emissions among the proposed new coal-fired plants in the Southwest. **Projected carbon dioxide emissions: 12,600,000 tons per year.**

Toquop, Nevada. Sithe Global, the owner of the proposed Desert Rock plant, proposes to build a 750-MW unit on the Arizona border near Mesquite, Nevada. As at Desert Rock, this plant would use supercritical pulverized coal technology, which increases thermal efficiency but does not control carbon dioxide emissions. A draft environmental impact statement is expected in December 2006. According to Sithe, the plant's output would be used to provide electricity to the Las Vegas metropolitan area, Arizona, New Mexico and southern Nevada. Sithe estimates that the Toquop plant would use about 800 million gallons of water per year. **Projected carbon dioxide emissions: 6,300,000 tons per year.**

White Pine Project, Nevada. White Pine Energy Associates, an affiliate of LS Power Group, proposes to build up to 1,600 MW of new capacity near White Pine in eastern Nevada. Its current permit application seeks authority to build units 500 to 800 MW in size and using conventional pulverized coal combustion. According to LS Power, the project, which is being developed to meet baseload energy needs in Nevada and the western United States, will need to have a long-term contract in place with either Nevada Power, energy wholesalers or an outside market in order to be economically viable. **Projected carbon dioxide emissions: 5,500,000 tons per year.**[21]

Intermountain Power Plant Unit 3, Utah. The Intermountain Power Agency proposes to add a 950-MW conventional pulverized coal unit to join two existing units at the Intermountain Power Plant (IPP) near Delta, Utah. Adding a new 950-MW unit to the existing 1,640 MW of capacity at IPP would catapult this plant into first place as the largest coal-fired generating facility in the western United States. Four parties, Utah Associated Municipal Power Systems, PacifiCorp, Southern Nevada Water Authority and the City of Glendale, California, have signed a participation agreement with Intermountain to obtain a portion of Unit 3's output. But to avoid circumventing California's new global warming law, California cities can only purchase new power from out-of-state plants if they meet a rigorous greenhouse gas performance standard. Thus California law precludes California cities and power companies from buying electricity from new coal plants that fail to address global warming. The Intermountain Power Agency has stated that it may build an integrated gasification combined cycle (IGCC) unit at this location, but it has made no binding

Wasted resources: Tri-State's proposed plants would use old technology

Tri-State Generation and Transmission Association, Inc. supplies electricity to mostly rural Colorado, Wyoming, New Mexico and Nebraska, and currently has total assets of about $2.1 billion. Tri-State's directors have approved a plan to build 2,100 MW of new coal-fired capacity in Kansas and/or Colorado and up to 1,000 miles of new transmission lines to serve these markets, at a cost of over $5 billion. If completed, these new plants would release over 15 million tons of heat-trapping carbon dioxide to the atmosphere.

There are no proposed measures to control or sequester carbon dioxide emissions at Tri-State's new units. In addition, each 700 MW unit is expected to consume nearly 2.6 billion gallons of water annually. Water for a unit in Colorado would come from the over-appropriated Arkansas River. The 5.2 billion gallons per year needed for new Kansas units would come from the Ogallala Aquifer, the lifeblood of the high plains region, which is already under stress from overpumping.

In addition to the questionable load growth projections used to justify these projects, Tri-State's investment would lead to enormous rate increases—as much as 65 to 80% in the near term—that would hurt the local economies of the rural areas it serves. Ironically, much of this area is prime territory for wind, biomass and solar energy development—resource choices that could help local economies.

commitment to do so. Assuming IPP Unit 3 uses a conventional wet cooling tower, as described in the facility's air permit, we estimate it will require 10 billion gallons of water per year. **Projected carbon dioxide emissions: 6,900,000 tons per year.**

Hunter Power Plant Unit 4, Utah. In addition to its interest in owning a portion of the new unit being proposed at the Intermountain Power Plant, PacifiCorp is considering expanding its existing plant near Castle Dale, Utah, and Capitol Reef National Park by adding a new conventional pulverized coal unit. As an alternative to this expansion, PacifiCorp is considering a new 600 MW IGCC facility at the Jim Bridger power plant in Wyoming. According to PacifiCorp's 2006 Integrated Resource Plan, Hunter's new 600-MW Unit 4 will be used to supply electricity to the eastern portion of the company's service area. Assuming Hunter Unit 4 uses a conventional wet cooling tower, as described in the facility's air permit, we estimate it will require 6.1 billion gallons of water per year. **Projected carbon dioxide emissions: 4,200,000 tons per year.**

CHAPTER 3

Cleaner choices for the future: meeting energy demand and limiting greenhouse gas emissions with energy efficiency and renewable energy sources

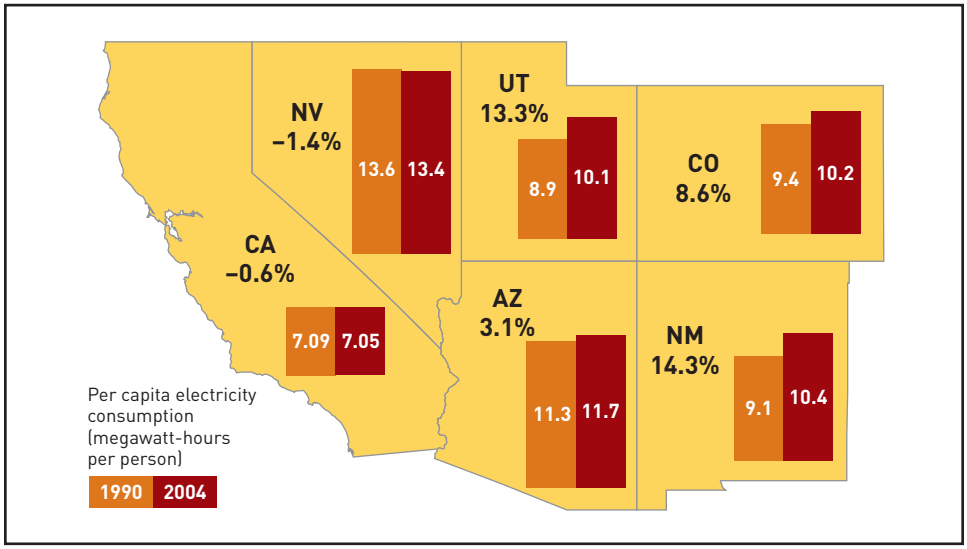
The Southwest does not need to build more coal-fired power plants to meet its growing energy demand. Cost-effective, nonpolluting alternatives are available. In particular, energy efficiency has consistently proven to be the most economical way to meet rising demand for electricity. And unlike coal, energy efficiency does not result in any increased global warming pollution. As shown in Figure 2, between 1990 and 2004, per capita electricity consumption increased 4.7% across the American Southwest. But this trend is not inevitable. California's per capita consumption declined over the same period, and it is 30 to 50% lower than per capita electricity consumption in any other southwestern state.

A study published in 2002 by the Southwest Energy Efficiency Project for the six-state region of Arizona, Colorado, Nevada, New Mexico, Utah and Wyoming estimated that aggressively pursuing commercially available, cost-effective energy-efficiency measures across the region would result in annual energy savings of 99,000 gigawatt hours (GWh) by 2020.[22] Achieving these energy savings would avoid the need to construct 26 new 500-MW coal plants.[23]

Renewable energy offers a sustainable way to feed a growing energy appetite without increasing global warming pollution. The Southwest is ideally suited to the development of renewable energy sources including solar, wind, biomass and geothermal. Figures 3, 4, and 5 show the location and quality of the Southwest's solar, wind, biomass and geothermal

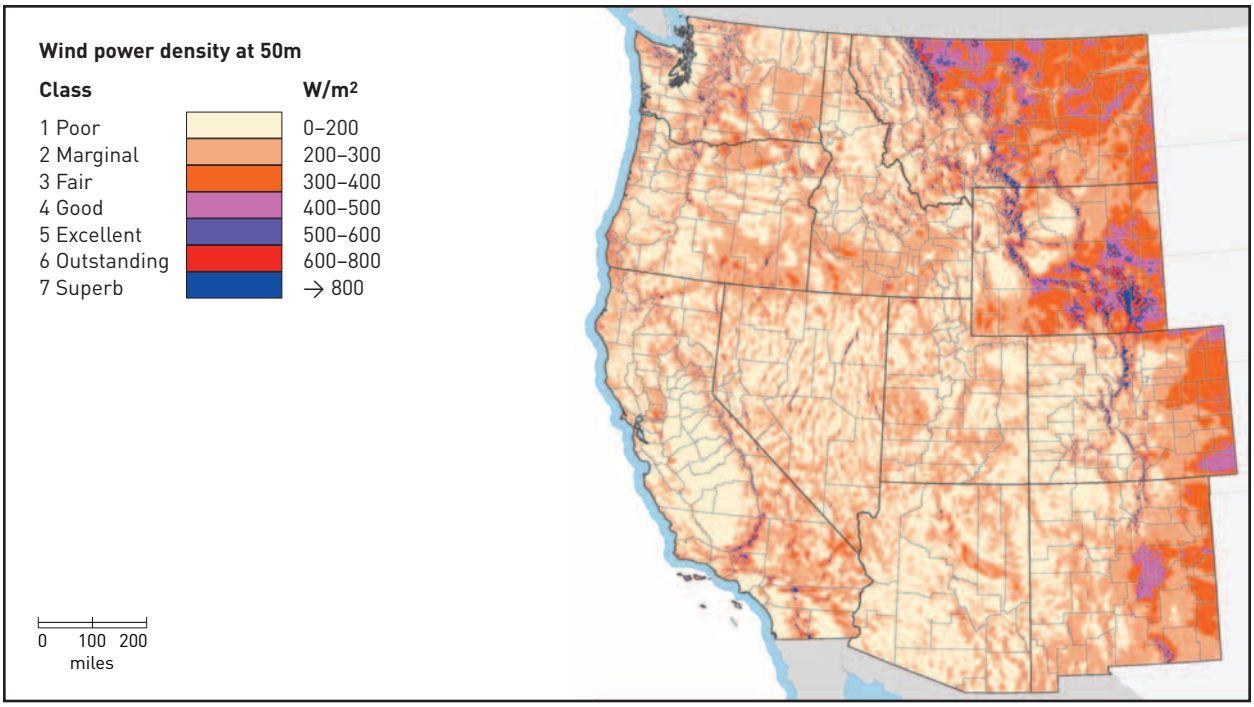
FIGURE 2

Trend in per capita electricity consumption in southwestern states, comparing consumption in 1990 and 2004



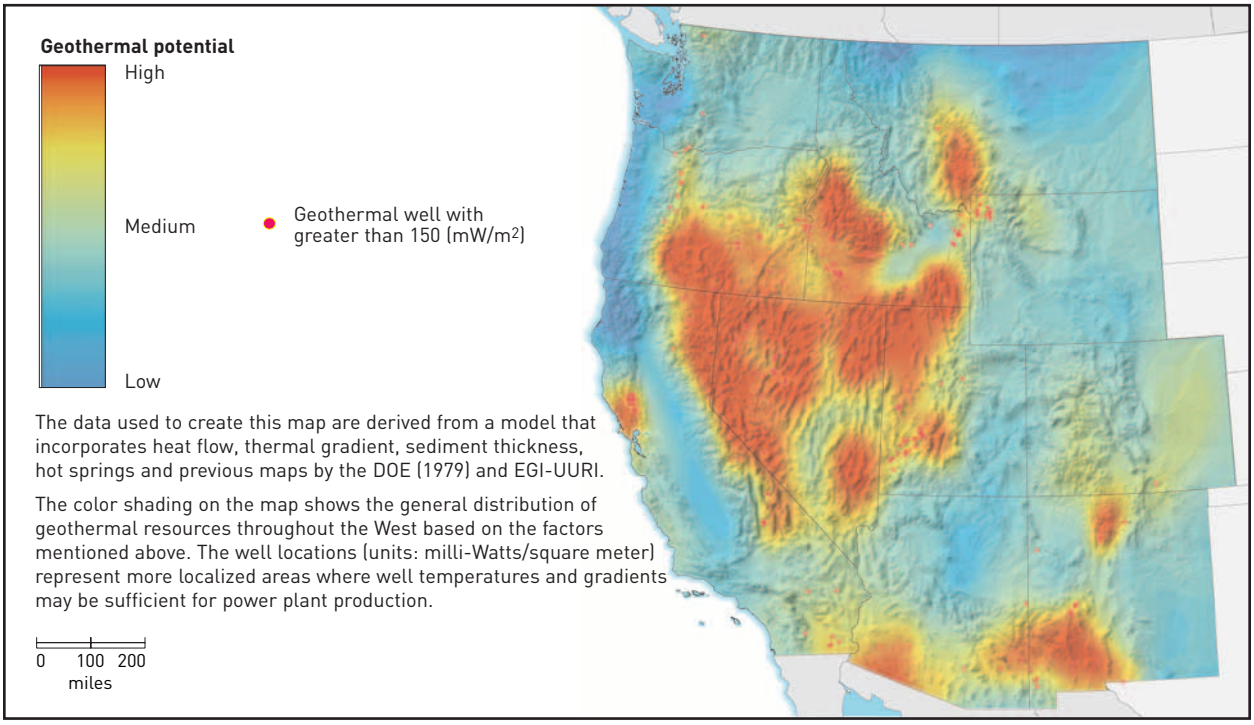
Between 1990 and 2004, per-capita electricity consumption increased 4.7% across the American southwest.

FIGURE 3
Wind resources in the western United States



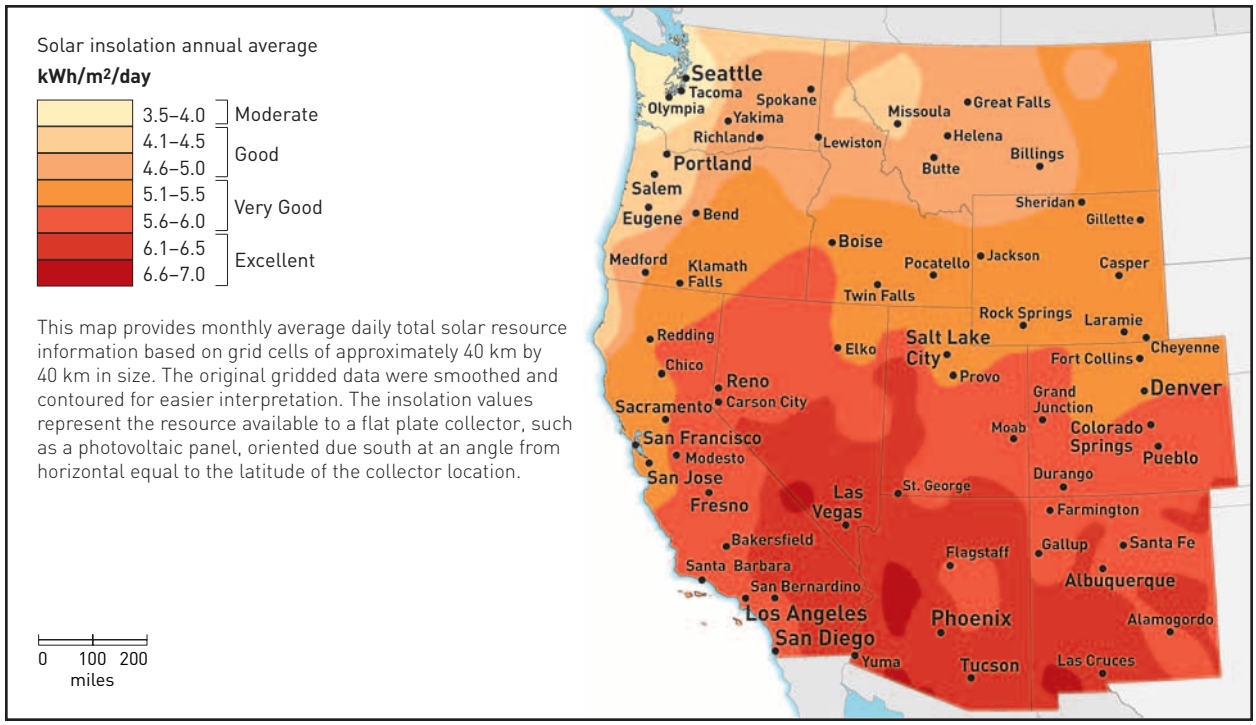
Source: National Renewable Energy Laboratory, 2004.

FIGURE 4
Geothermal potential in the western United States



Source: Western United States Geothermal Database, Southern Methodist University Geothermal Lab 2001

FIGURE 5
Annual solar potential for flat plate collection (PV)



Source: National Renewable Energy Lab 2002

resources. Table 2 shows that the total potential for renewable resources in the five Southwestern states of Arizona, Colorado, Nevada, New Mexico and Utah is more than 1.2 million GWh per year. Tapping just 5% of this potential would equal the output of more than sixteen 500-MW coal plants.

In its 2006 report, the Western Governors Association's Clean Diversified Energy Advisory Committee (CDEAC) identified what portion of the West's renewable energy potential could realistically be achieved by 2015. Based on the work of its various technology task forces and looking at a broader 18-state Western region,[24] the CDEAC identified 8,000 MW of solar electric resources, 5,600 MW of commercially viable geothermal resources, and 10,000 MW of biomass resources that could realistically be developed by 2015. In

TABLE 2
Renewable resource potential in the western United States (GWh/year)

State	Wind	Geothermal	Biomass	Solar	Total
Arizona	5,000	5,000	1,000	101,000	112,000
Colorado	601,000	-	4,000	83,000	688,000
New Mexico	56,000	3,000	500	104,000	163,500
Nevada	55,000	20,000	1,000	93,000	169,000
Utah	23,000	9,000	1,000	69,000	102,000
Total	**740,000**	**37,000**	**7,500**	**450,000**	**1,234,500**

Source: Estimates are from Western Resource Advocates, *Renewables Energy Atlas of the West,* Boulder, CO, 2001, 13.

addition, the CDEAC identified 5,000 to 9,200 MW of new wind resources that could be developed with minimal transmission additions and found that this amount could rise dramatically (up to 25,000 MW) as new transmission becomes available.[25]

Other studies also suggest that renewable resources can be dependably and economically deployed across the Southwest much more than they currently are. A 2004 study by Western Resource Advocates examined two scenarios for meeting energy demand in the seven-state, interior-west region of Arizona, Colorado, Montana, Nevada, New Mexico, Utah and Wyoming. One scenario projected to 2020 the current practice of relying on natural gas and coal to generate electricity. The other scenario was a diversified energy portfolio including 20% in renewable sources and large investments in energy efficiency. The study concluded that by 2020, the diversified energy portfolio lowered the region's annual power-sector carbon dioxide emissions by 52 million tons (21%) compared with 2002 levels and by 141 million tons (42%), compared with the natural gas and coal scenario for 2020. The diversified portfolio also decreased the region's electricity production costs by $2.5 billion per year, with no adverse impact on the reliability of the electricity system.[26]

Investing in clean energy can also yield economic benefits to western communities. According to analysis by the Energy Efficiency Task Force of the Western Governors Association's CDEAC, implementing best practice energy efficiency policies and measures across the 18 state CDEAC region would yield $53 billion in net economic benefits between 2005 and 2020.[27] A 2005 study by Western Resource Advocates examining the economic impacts of renewable energy development in northern Nevada found that developing 1000 MW of wind power and 800 MW of geothermal power in that part of the state would create over 3,350 construction jobs and 580 operation jobs. The projects would also provide $182 million in sales tax revenue and over $25 million annually in property tax revenue to state and local governments.[28]

A new choice for coal: Xcel Energy commits to advanced technology in Colorado to capture and store global warming pollution

Among all the new coal-fired power plants now in planning or construction in the Southwest, only one plans to use advanced technology to reduce, capture and sequester carbon dioxide emissions. Xcel Energy announced plans this summer to build a 300–350 MW facility in Colorado using the integrated gasification combined cycle, or IGCC, process. This technology uses a chemical process to turn coal into a gas, which is then burned in a highly efficient combustion turbine to generate electricity. IGCC is more efficient than conventional pulverized coal combustion and facilitates the capture of carbon dioxide emissions so they can be sequestered deep underground. Xcel has not yet announced a location for the plant, which is still subject to approval by the Colorado Public Utility Commission. Xcel has said that it intends to commence construction of its Colorado IGCC plant in 2009 and to bring it into service by 2013. If the company successfully develops this project and achieves deep cuts in carbon dioxide emissions through capture and sequestration, it will serve as an important model for other utilities in the region and across the country.

Western utilities are already beginning to tap these rich renewable energy sources in projects including the following:

- Xcel Energy in Colorado plans to add 775 MW of wind energy by the end of 2007 to their current 282 MW of wind power.
- Public Service Company of New Mexico and Xcel Energy added approximately 400 MW of wind generating capacity in New Mexico during the period of 2003 to 2005.
- Arizona Public Service Company in 2005 acquired 145 MW of renewable energy generating capacity (wind, geothermal and biomass) to start service during 2006 and 2007.
- Power providers in Texas added 1,980 MW of wind capacity between 2002 and 2004.
- Concentrating solar power (CSP) systems are utility-scale plants for converting solar energy to electricity, using mirrors or lenses to focus the sun's energy. Nine parabolic trough CSP plants have been in operation in the Mohave Desert for two decades. Construction of a new 64-MW CSP plant in Nevada is scheduled for completion in 2007.[29] Xcel Energy recently announced a new 8 MW solar plant to be located in south central Colorado, combining a concentrating solar power system and advanced flat plate arrays.[30] In California, PG&E has announced plans to acquire 500 MW in solar power, beginning in 2010.[31]

Further developing these alternative resources to meet growing energy demand and to replace old coal-fired plants will provide fuel diversity that insulates the region from volatility in fossil fuel markets. As an indigenous resource, renewable energy also enhances the nation's energy security.

CHAPTER 4

States take the lead to require climate-friendly power

The science of global warming has developed rapidly over the last several years. Though the specific local effects cannot be predicted with certainty, we know that the Southwest will face dire challenges as temperatures rise, and that carbon dioxide emissions around the world must be dramatically reduced if we are to avoid the catastrophic effects of global warming. We also know that energy-efficiency measures and the Southwest's abundant solar, wind, geothermal and biomass resources are available now to meet new electricity demand. And we know that it is possible to build coal-fired power plants that reduce and sequester carbon dioxide emissions, and that one western utility has already chosen to do so. Knowing all this, it is obvious that spending many billions of dollars on new coal-fired power plants that do not reduce or control carbon dioxide emissions is both financially irresponsible and environmentally reckless. The Southwest can and must do better.

Recognizing the urgency of the issue, State, tribal and local governments across the West are getting down to the business of protecting the region from global warming. The western governors recently made a commitment to meet growing electricity demand by developing 30,000 megawatts of "clean and diverse" energy by 2015.[32] Several states have put in place specific measures to lower global warming pollution from new power supplies.

As the biggest economy, energy consumer and source of greenhouse gas emissions in the West, California has set the standard for state leadership on climate change. In June 2005, Governor Schwarzenegger issued an executive order establishing targets for California to reduce greenhouse gas emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80% below 1990 levels by 2050. The California Public Utilities Commission has proposed a greenhouse gas emission performance standard for long-term utility resource procurements that is no higher than the emissions from a combined-cycle natural gas turbine,[33] which is roughly 40% of the emissions from a conventional coal plant, per unit of electricity generated. In November 2005, the California Energy Commission adopted the same standard for California utility procurements.[34] Because California buys so much power generated in other states, these procurement standards have great potential to influence power plant design choices throughout the West. If California utilities cannot buy power from coal-fired plants with high greenhouse gas emissions, in many cases those plants will not be built.[35]

On August 31, 2006, the California Legislature passed Assembly Bill 32, which requires the California Air Resources Board to reduce statewide greenhouse gas emissions to 1990 levels by 2020. Senate Bill 1368 helps account for California's broader footprint on global warming by prohibiting any entity serving the electricity market in California from entering a new or renewed financial commitment for baseload power, including contracts five years or longer in duration, unless it meets a greenhouse gas emissions performance standard. The bill encompasses municipal as well as private utilities.

Other western states are also taking action to establish limits on global warming pollution. Governors Napolitano in Arizona, Richardson in New Mexico and Huntsman in Utah have

created climate change advisory groups in their states.[36] Governor Richardson's executive order establishing the New Mexico advisory group contains targets to reduce greenhouse gas emissions to 2000 levels by 2012, to 10% below 2000 levels by 2020, and to 75% below 2000 levels by 2050. In February 2006, Governors Napolitano and Richardson launched the Southwest Climate Change Initiative, designed, among other things, to identify options for reducing greenhouse gas emissions.[37] And on September 8, 2006, Governor Napolitano signed Executive Order 2006-13, establishing a statewide goal to reduce Arizona's greenhouse gas emissions to the 2000 level by the year 2020, and to 50% below the 2000 level by 2040.

In addition, local governments are working to control greenhouse gas emissions. In June 2005, the U.S. Conference of Mayors unanimously adopted a resolution that calls for actions at the federal, state and local levels to reduce emissions 7% below 1990 levels by 2012. As of September 8, 2006, 294 municipalities, including Albuquerque, Denver, Las Vegas, Reno, Salt Lake City and Tucson had accepted the challenge contained in the resolution.[38]

CHAPTER 5

Conclusion

There is promising movement in the Southwest to start cutting global warming pollution and chart a path to providing climate-friendly power for the region. But there could not be a more critical time for bold ideas and visionary leadership. The decisions made today about how to address future power needs will shape the Southwest's energy and environmental future for the next half-century. Today's policies will be decisive in the urgent fight against global warming.

To ensure that the region realizes a fresh vision of clean air and climate-friendly energy, we recommend policymakers in the Southwest adopt the following policies:

1. Stabilize and quickly begin to reduce emissions of global-warming pollution through binding caps and require all new power generation proposals to meet their obligations under these limits.

2. Tap energy-efficiency resources as the foremost tool for addressing growing electricity demand. All states in the region should adopt well-designed regulatory incentives for public utilities to curb growing consumption, advanced building codes, comprehensive efficiency standards for electrical appliances, and innovative pricing and metering policies to spur efficiency. Energy efficiency should be incorporated as an essential alternative in electricity procurement and transmission project proceedings.

3. Adopt or strengthen renewable portfolio standards to harness the region's vast renewable energy potential. Arizona, Colorado, Nevada and New Mexico have established renewable energy standards; Utah should quickly follow suit.

4. Adopt policies to promote increased use of distributed and highly efficient combined-heat and power (CHP) resources. Such policies should include adopting Federal Energy Regulatory Commission standards for interconnection agreements, seeking CHP solutions to transmission and distribution constrained areas, and reviewing electricity rate structure, including standby rates, to make sure they are not discriminatory toward CHP.

5. Adopt comprehensive electric utility resource planning and procurement rules that weigh the full costs, benefits and risks of new electrical generating resources that will add harmful global warming pollution to the atmosphere. Planning and procurement rules should be transparent and allow full participation of the public.

6. Require all new coal plants, effective immediately, to maximize thermal efficiencies, use state-of-the-art pollution controls for all airborne contaminants including toxic air pollutants such as mercury, and curtail the heavy burden of global warming pollution. As a starting point, southwestern states should proactively move to adopt performance standards that leverage new technologies to capture and sequester heat-trapping greenhouse gases.

7. Support transmission pricing, access and operating policies that maximize the efficient use of the existing transmission system. Where new transmission capacity is still needed, it should focus on lines that provide access to areas rich in renewable resources.

The heat is on. It is time to demand that new electricity needs in the Southwest be met with 21st century solutions that effectively address the urgent threat of global climate change.

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